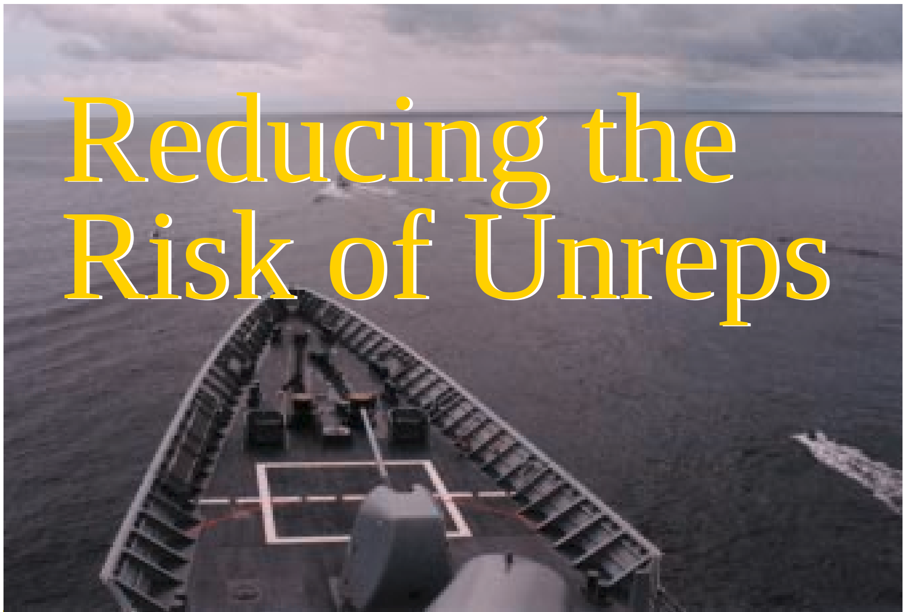

Reducing the Risk of Unreps

USS *Vincennes* (lower left) steams alongside the trailing line of barrels, maintaining unrep speeds and distances.

When two ships operate this close together, there is little time for recovery if one loses steering control.

By Ens. John Payne, USS Vincennes *(CG 49)*

When large ships rock 'n' roll within 150 feet of one another to replenish stores and fuel, there's always a risk to personnel and equipment. The greatest risk during an unrep is loss of steering control. Rough seas and the close proximity of ships to one another leave little time for recovery if something goes wrong. If you're not prepared, the results can be disastrous.

For example, it cost more than $5 million to repair the damage to an AOE and a CVN that collided during an unrep in 1995. In that mishap, the seas and winds were such that the helmsman aboard the AOE was continually using left rudder to keep his ship on the designated replenishment course. When a potential problem with rudder control arose, the AOE's crew executed the emergency-steering bill. This procedure initially involved placing the rudder amidships, which let the AOE's course drift to the right.

Personnel aboard the CVN knew their counterparts aboard the AOE had a steering problem, and the CVN turned to starboard to maintain distance between the two vessels. However, one requirement was overlooked in this course change: The bridge-watch team aboard the CVN didn't tell their counterparts aboard the AOE what they were doing. Once the after-steering helmsman aboard the AOE gained control and completed rudder checks, he put the rudder over left to regain the ordered replenishment course.

A series of events, including the start of an emergency breakaway and the shift of rudder control back to the bridge on the AOE, occurred in the next few minutes, and the AOE turned back to the left. Meanwhile, the CVN's course kept moving to the right. Last-minute orders to the helmsmen on both ships served only to reduce the angle of impact.

Finding realistic training for emergency situations like this is difficult. How do you safely demonstrate what happens when ships are moving near one another during a connected replenishment? That's a question we researched aboard USS *Vincennes* until we found an answer: Make a bumper-proof "oiler." The *Vincennes*' "oiler" let conning officers safely see what happens in a casualty. More importantly, it provided an opportunity for ship-control teams to respond to alongside-steering casualties.

Here's the procedure we used. We connected several barrels to a 500-foot-long line and towed it at unrep speeds behind a ship's boat. The boat crew deployed the barrels at distances that would give a conning officer a reference point to simulate the engaged side of a replenishment ship. To keep the experiment safe, the towing boat remained well ahead of the approach ship. Once alongside, bridge watchstanders measured distances to the simulated replenishment ship using a laser range finder.

With the "oiler" underway, *Vincennes* made her approach alongside the trailing line of barrels and maintained unrep speeds and distances. Members of the ship-training team (STT) then put the rudder over, simulating a casualty that sent the ship veering toward the "oiler." When the ship hit any of the barrels, the conning officer ordered, "All back full," and steered away from the barrels to avoid fouling the line.

Our first test involved putting the rudder over toward the "oiler" at 10 degrees to see how long it took before *Vincennes* hit the barrels. Discounting the Venturi effect (the suction created between two large bodies moving parallel to one another in water), the jammed 10-degree rudder afforded about 40 seconds before contact was made. The second test repeated the same experiment, but with a rudder jammed at 30 degrees. Collision this time occurred in 28 seconds.

Once watchstanders realized how quickly a catastrophe can happen, the STT members then imposed a series of drills to test the reaction time of the watchstanders. In this phase, the STT members put the rudder over 10 degrees toward the "oiler," then allowed the bridge-watch team a chance to recover steering through normal engineering operational sequencing system (EOSS) procedures. To avoid a collision, the watchstanders had to recognize the jammed rudder, respond to the casualty, then steer the ship away from the "oiler." Our master helmsman quickly noted the casualty and switched pumps and cables. After regaining control, he shifted the rudder away from the "oiler" to avoid contact. The watchstanders successfully finished this test in less than 40 seconds.

The second loss-of-steering-recovery drill again simulated a 10-degree jammed rudder. However, the master helmsman wasn't able to regain steering just by shifting pumps and cables; he had to transfer steering control to after steering. The after-steering helmsman shifted the rudder, using the local steering panel. Despite the added time required by shifting steering control aft, the after-steering helmsman was able to restore control and shift the rudder away from the "oiler" in time to avoid a collision.

Our final test sought to answer the long-standing debate about whether it's possible to counter the effects of a 10-degree jammed rudder with engines. When STT members jammed the rudder this time, the conning officer immediately ordered a twist (ahead flank, back two-thirds) to counteract the effects. Despite engine twists away from the "oiler," *Vincennes* could not overcome the rudder problem and hit the barrels. Although the engine twist didn't prevent collision, it did slow the swing of the ship and increased the amount of time before collision occurred.

What did we learn from these experiments? In all cases, we had less than a minute to respond to a casualty, recover steering control, and shift the rudder to avoid collision. We also proved it's unlikely you'll be able to counter a jammed rudder, using engines to twist the ship. The most important lesson learned from these experiments, according to the CO, "is that every second counts. First, you have to be proactive. Second, helmsmen and safety observers instinctively must execute planned responses. Last, you have to practice."

Unfortunately, the results from our experiments aren't completely accurate. We didn't have a perfect model, and, of course, we couldn't simulate the Venturi effect. Nevertheless, we have a good idea how important it is to be prepared and react quickly in the event of a loss of steering. With planning, training, and operational risk management, it's possible to avoid a catastrophe, even in the most dangerous operations.